

SUPPLY CHAIN PERFORMANCE ATTRIBUTES FOR THE FAST MOVING CONSUMER GOODS INDUSTRY

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ABSTRACT

This research paper identifies the supply chain performance attributes that are relevant to the Fast Moving Consumer Goods (FMCG) industry. The FMCG supply chains are analysed from the perspective of processes, components and typology. The typical issues faced by the FMCG supply chains are also explored. Three supply chain operational models are compared and identify SCOR as the one best suited for the FMCG industry. The survey, conducted with the respondents from four research cases across two product categories, demonstrates the acceptance and the usage of the performance attributes for the FMCG supply chains. The results also include the analysis of the typology of the research cases across two product categories.

INTRODUCTION

The Fast Moving Consumer Goods (FMCG) industry is a quick, agile industry with a wide range of products (Kumar, 2002). This is confirmed by Unilever (2007:5), a leading FMCG organisation, which stated that '150 million times a day, in 150 countries, people use our products at key moments of their day'.

Such a huge industry is easily recognised by its customers, and its supply chains are seen as a role model for other industries (Armstrong, Enright, Lempres & Rauch, 1996). FMCG industry supply chains generate innovative ideas and act as benchmarked frameworks for other industries, because of their high volumes of product flows, close interaction with their customers, less complex manufacturing processes and the dominance of retailers (to some extent). Some of their ideas such as point-of-sale solutions, transport milk runs and subcontracted manufacturing have been adopted by other industries (Mosquera, 2009).

However, a very complex underlying supply chain setup supports this industry. Despite the innovative ideas generated, FMCG supply chains are faced with unique challenges and issues (Kumar, 2002). Some of the issues, such as the bullwhip effect (relatively small variability in end-customer demand expands to successively high variability up the supply

chain; also known as the Forrester or ripple effect), and higher returns and transit losses, are widely evident in these supply chains.

In order to achieve the organisational goal of making money (Goldratt & Cox, 2004), supply chain managers try to find cheaper suppliers, low-cost manufacturing facilities, strategically located distribution centres and highly profitable or high-volume customer markets. Bartlett and Ghoshal (1998) and Smith (2008) state that supply chains often extend beyond the borders of a country in order to encapsulate these features, resulting in supply chain risks.

Supply chain managers often adapt new optimisation techniques to address these complexities and risks that also lead to new set of supply chain risks (Ostby, 2009). Also, the concern lies with the performance indicators the supply chain managers use to manage and monitor the supply chains (Mishra, 2008), resulting in using inappropriate measures to tackle the supply chain issues. In addition, some of the known and commonly used best practices, such as low-cost country sourcing and just-in-time, do not address the modern day issues (Kumar, 2009). Hence, a need was identified to find the appropriate supply chain performance attributes as a part of this research.

A further reason for conducting this research was to address those discouraging questions that many FMCG supply chains face, particularly in the light of the recent (year 2008/9) economic crisis (Bitran, Gurumurthi & Sam, 2006; Desai, 2008; Lofstock & Foucher, 2009; Resse, 2009; Blackstone, 2010; Bala, Prakash & Kumar, 2010):

- What is an appropriate operating framework for FMCG supply chains?
- What learning can we draw from the experiences of similar (developing) countries?

In the light of the above discussion, this research study intends **to identify the supply chain performance attributes that are relevant for the FMCG industry**, and which allow supply chain managers to accurately measure and monitor their supply chains.

FAST MOVING CONSUMER GOODS INDUSTRY SUPPLY CHAINS

The Confederation of Indian Industry (CII) (2005) defines the FMCG industry as one of the largest industries in the world. It comprises consumer non-durable goods and caters to the everyday needs of the consumer. The product characteristics are unique to the industry as they are non-durable, branded, packaged and consumed every month directly by the end consumer. The main segments of the FMCG industry are: personal care, packaged food and beverage, household care, spirits and tobacco. The published SWOT (Strength, Weakness, Opportunity and Threat) analysis for the FMCG industry indicates well co-ordinated distribution networks as its strength, while low technology initiatives as a weakness and irregular tax structures and imports as a threat to the industry (Deloitte, 2009; Kumar, 2009).

In turn, agile and rapid responsiveness, as highlighted by Fisher, Obermeyer, Hammond and Raman (1994), are the key differentiators of the FMCG industry. Cheng and Choi (eds.) (2009) also identify rapid response as one of the strengths of the FMCG industry. Joerg (2006) highlights an efficient customer response (ECR) approach as one of the main requirements for the FMCG industry.

The FMCG industry, with its own unique set of characteristics and attributes, is governed by the constraints and interfaces among its internal business functions (procurement, manufacturing, logistics, customer service, etc.). Similar constraints have also been identified among the components (suppliers and customers) of the supply chain. Kumar (2002, 2004) states that buying and selling are the key functions of FMCG organisations; while making, moving and storing are less important functions that are normally outsourced. The activities of a general FMCG organisation across the supply chain landscape are shown in Figure 1.

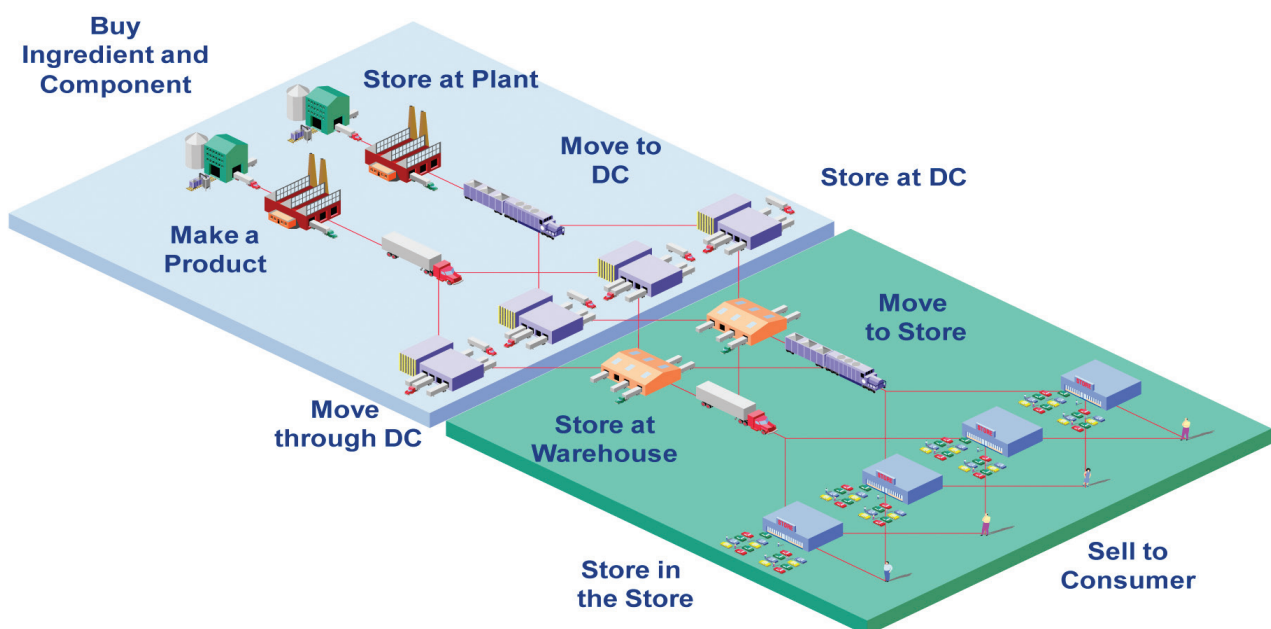


Figure 1: Supply chain activities in a consumer goods supply chain (Kumar, 2009)

Figure 1 shows that FMCG industry supply chains represent a structure of simple manufacturing processes but complex distribution networks. This study, therefore, is inevitably more focused on identifying issues within the distribution networks of the FMCG supply chains.

Typology of FMCG supply chains

Stadtler and Kilger (eds.) (2007) characterise the FMCG industry by functional attributes applicable to each partner, entity, member or location of supply chain and also structural attributes describing the structure of relations among its entities, for example, topography and integration. This is explained in Table 1.

Table 1: Typology for FMCG supply chain (Kumar, 2009)

Functional attributes	
Attributes	Contents
Products procured	Standard (raw material) and specific (packaging material)
Sourcing type	Multiple (raw material); Single/double (packaging materials)
Organisation of the production process	Flow line
Repetition of operations	Batch production
Distribution structure	Three to four stages
Pattern of delivery	Dynamic
Deployment of transportation	Unlimited routes (third stage)
Loading restrictions	Chilled and frozen transports
Relation to customers	Stable
Availability of future demands	Forecasted
Products life cycle	Several years
Products sold	Standard
Portion of service operations	Tangible goods
Structural attributes	
Attributes	Contents
Network structure	Mixture
Degree of globalisation	World wide
Location of decoupling points	Deliver-to-order
Legal position	Intra-organisational
Direction of co-ordination	Mixture
Type of information exchanged	Forecasts and orders

Table 1 also confirms that FMCG supply chains use complex distribution networks. Furthermore, it was established that FMCG organisations could use many different combinations for the buying function, but that this freedom could raise concerns among supply chain executives. Another two important aspects identified are the types of products involved (including their life cycle and shelf life) and the sharing of information among the various supply chain entities.

A detailed process map for the FMCG supply chains was developed based on SCOR (explained later in the article, under 'Supply chain performance') and Porter's value-chain model (Porter, 1998), for the internal business functions such as buy, make, move, store and sell, as shown in Figure 2.

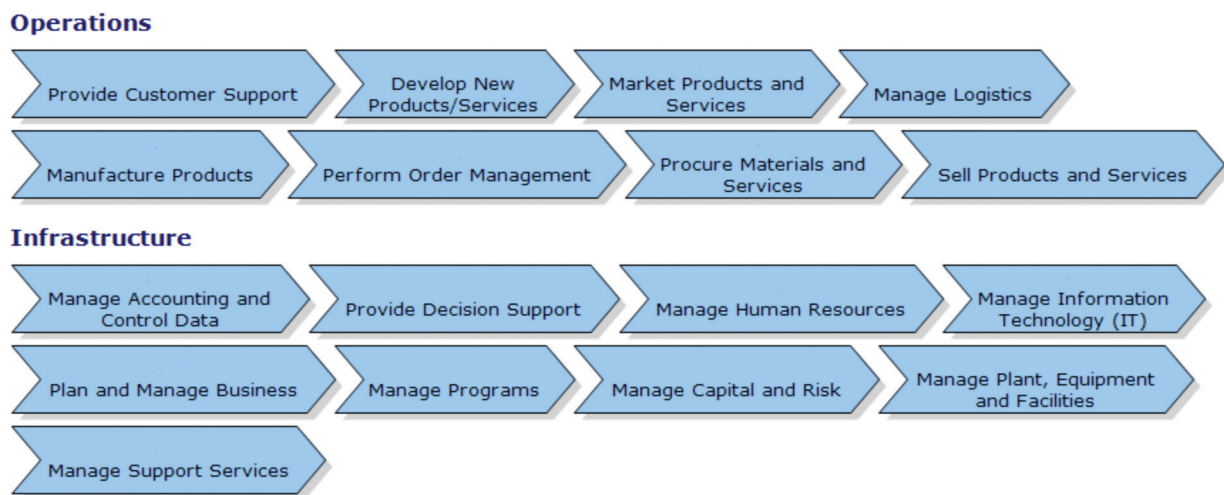


Figure 2: Process map for FMCG supply chains

Issues faced by FMCG supply chains

The focus of FMCG supply chains is on reducing costs (lean strategy) and improving efficiencies within the buying, distribution and selling functions (Stadtler & Kilger [eds], 2007). Also, retailers govern the selling function in this industry.

Kumar and Bala (2009) and Bala *et al.* (2010) highlight the issues faced by the FMCG supply chains:

- Supply chains own various production plants, including co-manufacturers and co-packers, which increases complexities in the supply chain.
- Distribution is handled by specialised firms, which increases the pressure on relationships. Transport hauliers, logistics firms and warehouse service providers are typically involved.
- The retail sector is pressurising the industry to manufacture and supply at the lowest possible price and to decrease the response time. The other concern with the retail sector is the 'dealer-owned brands', which makes them not only the FMCG organisations' customers, but also their competitors.

Hence, there is a need to identify performance attributes for the FMCG supply chains that could manage holistically the above risks and the supply chain performance.

Product categories in the FMCG industry

Not all FMCG organisations handle the entire range of product segments. A Deloitte report (2009) found that among the leading 250 global consumer goods firms, six of the top 20 FMCG organisations (Nestle, Procter & Gamble, Unilever, Pepsico, Kraft Foods and Coca-Cola) – based on net sales in financial year 2007 – are involved with only two product segments in common, i.e. 'dairy' and 'packaged food'. In addition, these two product

segments have been identified as universal product segments and the challenges faced by these product segments are independent of natural and geographic conditions (CII, 2005; Parthasarathy, 2009). Therefore, the probability of obtaining worthwhile results when comparing the supply chains of these two product segments between different countries is high. Hence, this study focused on only these two product segments for its research.

SUPPLY CHAIN PERFORMANCE

No single model can analyse the performance of the supply chain holistically (Eschinger, 2008). This research study cannot assess all the models available in the literature, for obvious reasons, and limits its discussion to three of them, which have multiple references in the literature. These are:

- **The resource-event-agent (REA) model** (Haugen & McCarthy, 2000)
As a semantic web, REA links economic events together across different firms, industries and nations. The links are activity-to-activity or agent-to-agent or person-to-person, not just firm-to-firm. This model defines the performance of the supply chain at a detailed level (activities) and focuses on links (relationships) to identify the existence of an activity. Such a model can define the characteristics of the relationships between processes in a supply chain, but lacks the depth needed to define the functional typology of a process itself. Also, the details (i.e. Key Performance Indicators or KPIs) related to the strategic and tactical levels cannot be inferred from this proposed lower level of detail.
- **The supply chain operations reference (SCOR) model** (Supply Chain Council, 2011)
The SCOR model is a business process reference model that includes business process re-engineering (standard definition of processes), benchmarking (standard metrics) and best practice analysis (management practice for best-in-class performance). The SCOR model is widely used in academia and in practice. However, the model does not address the areas of sales and marketing, HR (training), R&D (product development and quality assurance) and IT, and it does not attempt to prescribe how a particular organisation should conduct its business. The SCOR model, similar to the REA model, is also focused on the activity involved. It uses a hierarchical framework to depict the top- and lower-level details.
- **The balanced scorecard (BSC)** (Kaplan & Norton, 1996)
The BSC was developed as a multidimensional framework for describing and implementing a firm's strategic intent at all levels. This is achieved by linking objectives, initiatives and measurements to the organisation's strategy. The BSC is widely used across the industry. The BSC, although comparatively elaborate and comprehensive, reflects a high degree of freedom regarding customisation, resulting in most instances in the BSC functioning in isolated and independent frameworks. Hence, in practice, two separate instances of the use of the BSC cannot be compared and benchmarked against each other. Also, it fails to suggest best practices at an activity level.

Comparison of operational performance models

The above three models each provides a sound model for a supply chain. However, the objective of this study was to identify a model that qualifies in terms of the following five criteria:

1. It must be suitable for the FMCG industry.
2. It must define standard supply chain activities.
3. It must be capable of analysing and measuring the performance of a supply chain at all levels and across all activities.
4. It must allow for benchmarking.
5. It must suggest best practices within the supply chain environment.

The three models were compared on a 3-grade scale (very strong, strong and not strong) as shown in Table 2.

Table 2: Comparison criteria for the operational performance models

Criterion	REA	SCOR	BSC
Suitable for FMCG industry	Not strong	Very strong	Strong
Define standard supply chain activities	Not strong	Very strong	Strong
Analyse and measure performance at all levels/all activities	Not strong	Strong	Very strong
Provide benchmarking	Not strong	Very strong	Not strong
Suggest best practices	Not strong	Very strong	Not strong

It is evident from Table 2 that the SCOR model strongly qualifies on all five criteria. A further comparison was made between the BSC model and the SCOR model at a detailed level, as BSC is widely used by businesses. It was found that most of the performance metrics noted in the BSC also exists in the SCOR model, and in addition, the SCOR model permits benchmarking and provides a best-in-class framework. Therefore, the SCOR model was chosen to represent the operational performance model in this study.

Supply chain performance attributes

The performance attributes of the SCOR model (linked to indicator variables) are characteristics of a particular supply chain that allows it to be analysed and evaluated against other supply chains (Supply Chain Council, 2011). The indicator variables are a set of primary and high level measures that crossed multiple SCOR processes.

Table 3 provides the definition of the six performance attributes and 11 indicator variables. The latter two additional indicator variables (supplier management and customer management) are included in order to make the list holistic as these indicator variables are not covered by the SCOR model.

Table 3: Definitions for supply chain performance attributes (Supply Chain Council, 2011)

Performance attribute	Performance attribute definition	Performance indicator variables
Supply chain reliability	The performance of the supply chain in delivering: the correct product, to the correct place, at the correct time, in the correct condition and packaging, in the correct quantity, with the correct documentation, to the correct customer.	1. Perfect order fulfilment
Supply chain responsiveness	The speed at which a supply chain provides products to the customer.	2. Order fulfilment cycle time
Supply chain flexibility	The agility of a supply chain in responding to marketplace changes to gain or maintain competitive advantage.	3. Upside supply chain flexibility
		4. Upside supply chain adaptability
		5. Downside supply chain adaptability
Supply chain costs	The costs associated with operating the supply chain.	6. Supply chain management cost
		7. Cost of goods sold
Supply chain asset management	The effectiveness of an organisation in managing assets to support demand satisfaction. This includes the management of all assets: fixed and working capital.	8. Cash-to-cash cycle time
		9. Return on supply chain fixed assets
Component management	The operational management of the supply chain components such as suppliers and customers.	10. Supplier management
		11. Customer management

RESEARCH STRATEGY

Research approach

A focused quantitative approach was used to address the research objective and to obtain comparative findings between the research cases, as shown in Figure 3.

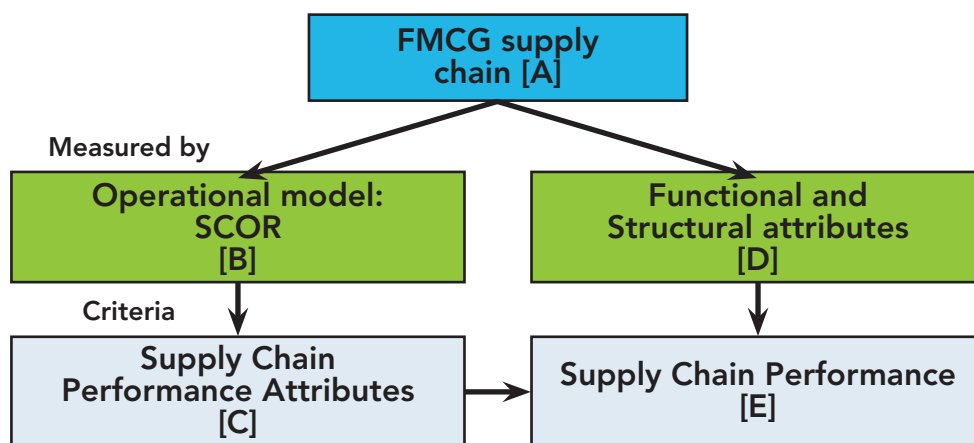


Figure 3: Investigative approach

Participants/respondents

A non-probability convenience sampling technique was used, based on the following criteria:

- The sample should be from the FMCG industry.
- The sample must represent either of the product segments and similar products.
- The sample should provide access to its key information (primary data).
- There is secondary data available for the sample.

A set of four cases (as shown in Table 4) was selected in order to identify inter-case similarities/differences and cross-case findings. The supply chain positions were identified as respondents that are similar between the cases from the products categories, leading to a set of 14 from each case – a total of 56 respondents and 28 per product category.

Table 4: Set up of research cases

Product segment	Cases	
Dairy	Mother Dairy (Mother Dairy)	Amrit Food (Amrit Food)
Packaged food	Dabur India (Pty) Limited (Dabur)	Surya Foods (Pty) Limited (Surya)

Measuring instrument(s)/methods of data gathering

A protocol based on the investigative approach to obtain the primary and secondary data was used.

Primary data

A survey was conducted using a questionnaire (mostly close-ended questions with a few open-ended questions) to obtain the primary data. A total of 11 variables in the form of statements were compiled for the construct, namely the supply chain performance indicators. Each item was anchored on a 5-point Likert measurement scale of 'strongly disagree', 'disagree', 'not sure', 'agree' and 'strongly agree'. Additional demographic questions were included such as industry sector, management level, number of suppliers, manufacturing plants, DCs and customers, number of employees and type of supply chain system. The draft questionnaire was then subjected to a pilot study with nine participants (supply chain managers in the FMCG industry and independent of the research cases). The statements in the questionnaire were amended based on the feedback from the respondents.

Response collection

To increase the probability of a relatively high response rate (between 70% and 90%), targeted respondents were invited by e-mail to participate in the research. A one-on-one meeting session was planned with each respondent to collect the responses in order not to omit any data and also to provide clarity on the spot.

Secondary data

Secondary data (and qualitative data) was obtained from published business and financial reports, internal project reports, minutes of meetings and data from the respective information systems. The researchers also attended 11 supply chain conferences to identify recent trends in the FCMG industry and the advancements in the field of supply chain management. In addition, the documents from each research case were also analysed such as planning workflow, annual reports, organisational structure and customer query reports.

Reliability

An internal consistency measure (Cronbach's alpha, minimum value of 0.7) to assess the overall reliability of the measurement scales was used. A 'split-half' approach was also used. Modified questions were used in the protocol covering the typology and the performance attributes.

Validity

The construct validity method was used. Multiple sources of data and the pilot study were used to test the internal and external validity of the findings.

Data preparation and screening

The sample was subjected to several preparation and screening steps for the following:

- **Missing data:** The questionnaire was designed to ensure that all statements and demographic questions were filled in. The one-on-one meeting session with the respondent assisted in avoiding missing data.
- **Univariate outliers:** If the average score for a particular indicator variable was beyond calculated limits of the mean \pm 3 standard deviations, it was regarded as a univariate outlier. Cases with such extreme scores were deleted from the dataset.
- **Internal consistency:** The average scores of the composite indicator variables were evaluated for internal consistency with Cronbach's coefficient alpha method (value 0.7).
- **Non-response bias:** The questionnaire was designed for a self-regulatory response by the respondent. The researchers have in no way provided an input to the response of the questionnaire in order to have non-response bias.

Data analysis

Data analysis was conducted through the use of the Student's t-test, also known as the t-test. The reasoning for selecting the t-test was based on the goal of the research and the type of data available (small sample of 28 per product category).

Built-in Microsoft Excel models were used to conduct the t-test. The t-test values were obtained between the cases for each product segment for each of the variables, and then compared with the means of each of the variables between the cases.

Limitations of the research

The scope of this study was limited to the respondents from the four cases from the dairy and packaged food segments. Only three operational performance models (REA, SCOR and BSC) were studied to analyse the FMCG supply chains. The SCOR model was chosen as the preferred operational model. Ethical issues (such as trust and corporate responsibility) were not included.

DISCUSSION

The 11 indicator variables for the six supply chain performance attributes were tested and compared within and across cases.

Reliability

This indicator variable is considered a performance attribute on a similar level by all four of the research cases. This is also found to be in line with the FMCG industry expectation (Richey, Roath, Whipple & Fawcett, 2009). In the dairy segment, for the smaller-sized case, and based on sales revenue, reliability is highly important in order to sustain and grow the customer base. However, in the packaged food segment, reliability is more crucial to meet the volumes of the market, and for the larger-sized case, based on sales revenue, the aim is to achieve reliability more rigorously.

Responsiveness

In the packaged food segment, the indicator variable of responsiveness was considered a performance attribute on a similar level by the involved cases. The cases are faced with changing customer demand patterns, prompting their supply chains to be responsive. In the dairy segment, the supply chain of the smaller-sized case (based on annual revenue) is more responsive than that of the larger-sized case, with the former being more involved with the introduction of new stock-keeping units (SKUs) into the marketplace, hence a necessity to service those customer bases more promptly and quickly.

Agility

In the packaged food segment, the associated indicator variables – upside adaptability, downside adaptability and flexibility – are not considered as a performance attribute on a similar level by the involved cases. The larger-sized case is more reliant on the upstream suppliers and larger customer base, while the smaller-sized case has close ties with their suppliers, hence less concern about the upside adaptability KPI, though flexibility is a concern. In the dairy segment, the associated indicator variables for agility are considered equally important by the involved research cases. Both dairy cases are highly reliant and dependent on their primary supplier, the milk producers, and their customer base, hence this performance attribute is critical for their supply chain performance.

Cash-to-cash cycle time

In both product segments, this indicator variable is considered equally important by the supply chain managers. This is also found to be in line with the FMCG industry expectation, as cash flow is critical for the survival of the supply chains (Matson, 2009). The growing focus on account receivables and inventory has assisted organisations in controlling this indicator.

Return on fixed assets

In the packaged food segment, return on fixed assets is considered equally important by the involved research cases. As both research cases are heavily oriented towards manufacturing setups, a greater focus on this indicator variable is required to obtain the return on investment. In the dairy segment, this indicator variable is not considered equally important by the involved research cases. It is higher for the smaller-sized case because of its new existence in the marketplace – hence a greater focus on return on investments as compared to the larger-sized case that has almost depreciated all of its assets.

Supply chain management cost

In all the four research cases, this indicator variable is considered equally important. This performance attribute is the most used and monitored KPI in FMCG supply chains (as identified by Viswanathan, 2008), and the cost of planning and executing the supply chain is crucial to its survival and its impact on the organisation's bottom line.

It was established that the majority of the SCOR supply chain performance attributes are considered important by the research cases involved, although the findings varied between the product segments due to the nature of the product involved (shelf life and product life cycle). The findings from the dairy food segment's research cases revealed that managers are more concerned about the quality and safety aspects of the supply chain, while the managers from the packaged food segment's research cases focused on product proliferation and supplier reliability.

Also, the typology of a particular product segment, as identified in the case studies, was found to be similar to that of any other FMCG supply chain in terms of functional and structural attributes, as identified in the literature review. It was established in all four cases that they adopted simple manufacturing and complex distribution processes (which was also identified in the literature review). Some of the trends, such as 'dealer-owned brands' or 'private labelling' and the bullwhip effect are not evident among the cases.

CONCLUSION

In this research study, the SCOR model was used to compare the supply chains of the cases based on specific performance indicators. However, it was evident from this research that

none of the research cases have deployed an operating model to govern and streamline supply chains. It is recommended that a framework of the supply chain operating model be developed in order to improve the efficiencies and effectiveness of their supply chains.

The issues identified within the FMCG supply chains, such as inadequate use of technology, measurement criteria and supply chain adaptability, were found to be different to some extent between the product segments. However, some of the issues identified such as lower product quality, lower supply chain responsiveness, higher inventories, and unclear policies were similar in the two product segments. These issues were similar to those faced by any other FMCG supply chain, as identified in the literature. The fundamental characteristic of FMCG supply chains, i.e. the bullwhip effect, is not found in the supply chains in all four cases. This is because orders are received directly from customers, and shipments are direct deliveries as well, thus ignoring the order batching and demand projections.

Seven out of 11 indicator variables showed that the supply chain managers considered the performance attributes important to measure and monitor their supply chains. In some instances, the terminology and the calculation formulae used by them differed, though the essence of the measurement stayed the same.

It was found that the challenges identified within the FMCG supply chains could be managed if supply chain managers use appropriate measuring criteria that are specific to the FMCG industry and consider the holistic view and the goal of the supply chain.

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Table of acronyms

FMCG	Fast Moving Consumer Goods
CII	Confederation of Indian Industry
SWOT	Strength, Weakness, Opportunity and Threat
ECR	Efficient Customer Response
REA	Resource-Event-Agent
SCOR	Supply Chain Operations Reference
BSC	Balanced Scorecard
KPI	Key Performance Indicators
SKU	Stock-Keeping Units